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In re application of: Timothy R. Block et al.

Serial No.: 09/173,090

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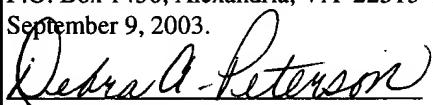
For: CLUSTER DESTINATION ADDRESS TABLE – IP
ROUTING FOR CLUSTERS

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Debra A. Peterson

Debra A. Peterson

APPEAL BRIEF IN SUPPORT OF APPEAL
FROM THE PRIMARY EXAMINER TO THE BOARD OF APPEALS

This is an appeal of a rejection of claims 1-63 of Application Serial Number 09/173,090 filed October 15, 1998. This brief is being submitted pursuant to 37 C.F.R. 1.192. A Notice of Appeal was filed on July 9, 2003.

1. Real Party in Interest

International Business Machines Corporation is the real party in interest.

09/17/2003 MGBREM1 00000003 090465 09170090

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Docket No.: RO998-088
Serial No.: 09/173,090

2. Related Appeals and Interferences

There are no related appeals or interferences pending with this application.

3. Status of the Claims

Appellants appeal from the rejection in the April 9, 2003 Office Action of claims 1-63. The claims on appeal are set forth in Appendix A.

4. Status of Amendments

No amendments were filed subsequent to the rejection of April 9, 2003.

5. Summary of the Invention

As shown on Figure 1 and discussed throughout the specification, the present invention provides a clustered system that does not rely on the presence of an intervening dedicated Local Area Network. This is one aspect of the present invention that allows the nodes of the cluster to exist on a public network, while remaining inaccessible to public nodes.

6. Issue

The Examiner has rejected claims 1-29, 31-35, and 37-63 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 5,371, 852, Attanasio et al. (hereafter Attanasio). The first issue is whether the Examiner is correct in asserting that these claims are anticipated by the Attanasio reference.

The Examiner has rejected claims 30 and 36 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,371,852, Attanasio and the knowledge and skill of the

ordinary person in the art. The second issue is whether the Examiner is correct in asserting that claims 30-36 are obvious under 35 U.S.C. §103 over Attanasio.

7. Grouping of Claims

Appellants expressly state that the rejected claims (1-63) do not stand or fall together. Appellants have grouped the claims on the basis of like subject matter and have organized this brief accordingly. Claim Group I includes claims 1, 4-39 and 42-63. Claim Group II includes claims 2 and 40, Claim Group III includes claims 3 and 41. Reasons why each claim group is separately patentable are provided in the Argument section of this appeal brief.

8. Argument

Rejection(s) under 35 U.S.C. § 102

The Examiner has rejected claims 1-6 and 37-44, claims 7-13 and 45-53, claims 14-21 and 54-63 and claims 22-29 and 31-35 under 35 U.S.C. § 102(b) as being anticipated by Attanasio. Appellants respectfully disagree with the Examiner's position and submit that claims 1-29 and 37-63 are not anticipated by Attanasio et al..

MPEP § 706.02 sets forth the standard for a proper 35 U.S.C. § 102 rejection: "the reference must teach every aspect of the claimed invention either explicitly or impliedly. Any feature not directly taught must be inherently present." Definitionally, a feature that is "inherent" is one that must necessarily be present.

Claim Group I (Claims 1, 4-39 and 42-63)

Independent claims 1 and 37 each explicitly call for a cluster servicer that facilitates cluster messaging with at least one other apparatus within said cluster without

requiring an intervening dedicated local area network. Cluster messaging is well known in the art to refer to message passing within a cluster for the purpose of performing certain management functions that are important to the cluster. Appellants' use of this term is consistent with its use in the industry. Consider, for example, page 2, lines 16-19 of Appellants' specification.

These applications relay cluster messages back and forth across the cluster network to control cluster activities. For instance, each computer system in a cluster continuously monitors each of the other computer systems in the same cluster to ensure that each is alive and performing the processing assigned to it.

A critical point here, then, is the fact that Appellants' claim pertains to messages that are passed amongst computer systems that are members of the same cluster. Thus, the present invention permits nodes to participate in the same cluster without the need for a dedicated LAN. It is important to distinguish this capability from the standard scenario of a non-cluster computer using the cluster as a computing resource.

Attanasio, while an important addition to the art, does not disclose cluster messaging between nodes of a cluster without the use of a dedicated intervening LAN. Instead, Attanasio discloses communication between a separate computer (called a Host) and a cluster. In the context of the Examiner's rejection, Attanasio simply discloses the typical cluster/computer scenario in which a non-cluster computer uses the cluster as a computing resource. Said yet another way, Attanasio discloses computer to cluster communication, not cluster node to cluster node communication. Indeed, review of Attanasio makes this point clear. Please consider column 6, lines 65-68 of Attanasio.

The encapsulated cluster 200 connects 127 to a high speed communication link 120, here called a network. Host computers 130, also connected to the network 120, communicate with the encapsulated cluster 200, and the nodes (105 through 109) within the cluster, over the network. ... A host computer could also be an encapsulated cluster of computers 200, i.e., the present invention, which gives a single system image to the network [emphasis added].

Please also consider column 11, lines 16-20.

Note that every incoming message addresses only the gateway of the cluster. This gives the cluster the appearance of a single computer to the network, even though the incoming messages can be routed to any of the nodes in the cluster [emphasis added].

As stated in these passages of Attanasio, the encapsulated cluster, which is connected to the network via a gateway, gives a single system image to the network. The Host is not a cluster node, but is instead the beneficiary of the single system image provided by the cluster. As a side note, the fact that the Attanasio inventors state that a Host computer could also be an encapsulated cluster does not mean that the Host is a member of a cluster. This instead means that the Host itself could be a cluster, meaning that two clusters could communicate with one another.

Accordingly, independent claims 1 and 37, and the dependent claims thereto, are not seen by Appellants to be fairly anticipated by Attanasio under 35 U.S.C. § 102. Appellants, thus, respectfully request reversal of the Examiner rejection.

Claim Groups II and III

Appellants respectfully submit that the claims of Groups II and III are patentable in that they depend from patentable independent claims 1 and 37. However, reasons why these claims are separately patentable appear below.

Claim Group II (Claims 2 and 40)

As to claims 2 and 40, Attanasio does not disclose routing of internal messages within the cluster to hosts outside the cluster. The passage of Attanasio relied upon by the Examiner (column 10, lines 62-67 and column 11, lines 45) refers only to sharing of a TCP port, and potentially, communication with an external Host. There is simply no discussion of transmitting internal cluster messages outside of the cluster. Therefore,

Appellants respectfully submit that claims 2 and 40 are not anticipated by Attanasio under 35 U.S.C. § 102.

Claim Group III (Claims 3 and 41)

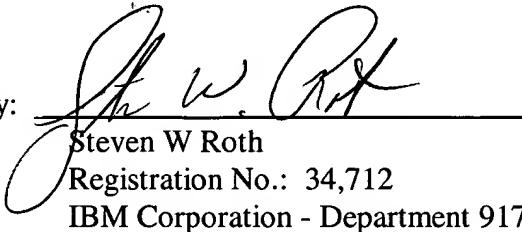
As to claims 3 and 41, Attanasio does not disclose an Internet Protocol routing at least one formatted cluster message to a system outside the cluster without requiring a dedicated LAN. The fact that Attanasio may disclose the use of IP for “configuring cluster messages” does not add up to use of IP routing for cluster messages to nodes that are not connected via a dedicated LAN.

In section II of the Office Action, the Examiner rejects claims 30 and 36 under 35 U.S.C. §103(a) as being unpatentable over Attanasio and the knowledge and skill of the ordinary person in the art. Appellants respectfully traverse this rejection. Claims 30 and 36 respectively depend from independent claims 22 and 31, and thus, are seen as patentable for the reasons set forth in the discussion of the claims of Claim Group I above.

9. Summary

For each of the foregoing reasons, it is submitted that the Examiner's rejections of claims 1-63 were erroneous, and reversal of his decision is respectfully requested.

Respectfully submitted,

By: 
Steven W Roth
Registration No.: 34,712
IBM Corporation - Department 917
3605 Highway 52 North
Rochester, Minnesota 55901-7829

Telephone: (507) 253-1600
Fax No.: (507) 253-2382

Docket No.: RO998-088
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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

- 1 1. (Currently Amended) An apparatus, said apparatus being a member of a cluster,
2 said apparatus comprising:
 - 3 at least one processor;
 - 4 a memory coupled to at least one processor;
 - 5 a cluster servicer residing in said memory, said cluster servicer facilitating cluster
6 messaging, with at least one other apparatus within said cluster, without requiring
7 an intervening dedicated local area network to said at least one other ~~computer~~
8 apparatus.
- 1 2. (Currently Amended) The apparatus of claim 1 further comprising a network
2 message servicer residing in said memory, said network message servicer routing at least
3 one cluster message from said cluster servicer to said at least one other ~~computer~~
4 apparatus.
- 1 3. (Currently Amended) The apparatus of claim 2 wherein said network message
2 servicer comprises:
 - 3 a User Datagram Protocol, said User Datagram Protocol formatting said at least
4 one cluster message to be sent to said at least one other ~~computer~~ apparatus;

5 an Internet Protocol, said Internet Protocol routing said at least one formatted
6 cluster message to said at least one other ~~computer~~ apparatus without requiring an
7 intervening dedicated local area network to said at least one other ~~computer~~
8 apparatus.

1 4. (Currently Amended) The apparatus of claim 2 wherein said cluster servicer
2 includes a cluster destination address table, said cluster destination address table
3 comprising at least one network address for said at least one other ~~computer~~ apparatus,
4 and wherein said cluster servicer retrieves said at least one network address for said at
5 least one other ~~computer~~ apparatus from said cluster destination address table to facilitate
6 cluster messaging with said at least one other ~~computer~~ apparatus without requiring an
7 intervening dedicated local area network to said at least one other ~~computer~~ apparatus.

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1 5. (Currently Amended) The apparatus of claim 4 wherein said cluster destination
2 address table further comprises cluster status information for said at least one other
3 ~~computer~~ apparatus.

1 6. (Currently Amended) The apparatus of claim 4 wherein said cluster destination
2 address table further comprises adapter information for said at least one other ~~computer~~
3 apparatus.

1 7. (Previously Amended) An apparatus comprising:

2 at least one processor;

3 a memory coupled to at least one processor;

4 a network message servicer residing in said memory; and

5 a cluster servicer residing in said memory, said cluster servicer including a cluster
6 destination address table, said cluster destination address table including at least
7 one address for at least one other apparatus within said cluster, wherein a message
8 to one of said at least one other apparatus can be sent by said cluster servicer
9 retrieving said at least one address for said at least one other apparatus from said
10 cluster destination address table and passing said retrieved address and said
11 message to said network servicer, wherein said network servicer routes said
12 message to said at least one other apparatus without requiring an intervening
13 dedicated local area network to said at least one other apparatus.

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1 8. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 further comprises adapter information for each of said at least one address for at least one
3 other apparatus networked to said apparatus.

1 9. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 further comprises status information for each of said at least one address for at least one
3 other apparatus networked to said apparatus.

1 10. (Original) The apparatus of claim 7 operating as a computer cluster, said
2 computer cluster comprising at least one other apparatus networked to said apparatus,
3 wherein each apparatus in said computer cluster comprises:

4 at least one processor;

5 a memory coupled to at least one processor;

6 a User Datagram Protocol residing in said memory, said User Datagram Protocol
7 formatting at least one packet to be sent between apparatuses in said computer
8 cluster;

9 an Internet Protocol residing in said memory, said Internet Protocol routing said at
10 least one packet between apparatuses in said computer cluster; and

11 a cluster servicer residing in said memory, said cluster servicer including a cluster
12 destination address table, said cluster destination address table including at least
13 one Internet address for said each apparatus in said computer cluster, wherein a
14 message can be sent to one of said each apparatus in said computer cluster by said
15 cluster servicer determining one of said at least one Internet address of said one of
16 said each apparatus in said computer cluster from said cluster destination address
17 table and passing said determined Internet address and said message to said User
18 Datagram Protocol, wherein said User Datagram Protocol formats said determined
19 Internet address and said message into at least one packet and passes said at least
20 one packet to said Internet Protocol, wherein said Internet Protocol routes said at
21 least one packet to said one of said each apparatus in said computer cluster.

1 11. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 includes at least one Internet address for said at least one other apparatus networked to

3 said apparatus, and wherein a message to one of said at least one other apparatus can be
4 sent by said cluster servicer retrieving said at least one Internet address for said at least
5 one other apparatus from said cluster destination address table and passing said retrieved
6 Internet address and said message to said network servicer.

1 12. (Original) The apparatus of claim 11 wherein said network message servicer
2 comprises:

3 a User Datagram Protocol which formats at least one packet from said message
4 and said retrieved Internet address; and

5 an Internet Protocol, said Internet protocol routing said at least one packet to said
6 one of said at least one other apparatus networked to said apparatus.

1 13. (Original) The apparatus of claim 12 wherein said at least one other apparatus
2 networked to said apparatus is networked through a plurality of routers, and wherein said
3 Internet Protocol comprises specific routing directions indicating which router of said
4 plurality of routers should be used for routing said at least one packet to said at least one
5 other apparatus.

1 14. (Previously Amended) A cluster of computers, each computer in said cluster of
2 computers comprising:

3 at least one processor;

4 at least one network adapter;

5 a memory coupled to said at least one processor;

6 a User Datagram Protocol residing in said memory, said User Datagram Protocol
7 formatting at least one packet to be sent between computers in said cluster of
8 computers;

9 an Internet Protocol suite residing in said memory, said Internet Protocol routing
10 said at least one packet between computers in said cluster of computers; and

11 a cluster servicer residing in said memory, said cluster servicer including a cluster
12 destination address table, said cluster destination address table including a cluster
13 destination address table entry for each computer in said cluster of computers, said
14 each cluster destination address table entry comprising:

15 an Internet address for each of said at least one network adapter;

16 status information for each of said at least one network adapter; and

17 adapter information for each of said at least one network adapter;

18 wherein said cluster servicer sends a cluster message to a destination computer in said
19 cluster of computers by determining an Internet address for said destination computer
20 from said cluster destination address table entry for said destination computer and passing
21 said determined Internet address of said destination computer and said cluster message to
22 said User Datagram Protocol, wherein said User Datagram Protocol formats said
23 determined Internet address and said cluster message into a packet and passes said packet
24 to said Internet Protocol, wherein said Internet Protocol routes said packet to said
25 destination computer, said Internet Protocol routing said packet to said destination
26 computer without requiring an intervening dedicated local area network to said destination
27 computer.

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1 15. (Original) The cluster of computers of claim 14 wherein said Internet Protocol on
2 said each computer in said cluster of computers includes a routing table, said routing table
3 including at least one routing table entry, said at least one routing table entry including a
4 subnet address and corresponding routing direction for said subnet address, and wherein at
5 least one additional routing table entry exists in said routing table for each computer in
6 said cluster of computers that is attached to a plurality of routers, said at least one
7 additional routing table entry including a subnet address and corresponding routing
8 direction for said subnet address that specifies to which router of said plurality of routers
9 to route said at least one packet.

1 16. (Original) The cluster of computers of claim 14 wherein said cluster servicer in
2 each computer in said cluster of computers can employ said cluster destination address
3 table, said User Datagram Protocol, and said Internet Protocol to route all cluster
4 messages necessary to maintain said cluster of computers.

1 17. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said status information in said cluster destination address table whether a

3 network adapter for one of said each computer in said cluster of computers is reachable or
4 unreachable.

1 18. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 assign cluster responsibilities to said each computer in said cluster of computers.

1 19. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 size cluster messages to each network adapter on said each computer in said cluster of
4 computers.

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1 20. (Original) The cluster of computers of claim 14 wherein at least one computer in
2 said cluster of computers has a plurality of network adapters, and wherein each cluster
3 destination address table entry corresponding to said at least one computer in said cluster
4 of computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

1 21. (Original) The cluster of computers of claim 20 wherein said cluster servicer can
2 send a cluster message to a destination computer with a plurality of adapters by
3 determining an alternate Internet address for said destination computer with a plurality of
4 adapters from said cluster destination address table corresponding to said destination
5 computer with a plurality of adapters, when a timely response from said destination
6 computer with a plurality of adapters is not received after sending a cluster message

7 addressed to said primary Internet address for said destination computer with a plurality of
8 adapters.

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1 22. (Original) A method comprising the steps of:
2 creating network address information for each computer in a cluster configuration;
3 storing said network address information on said each computer in said cluster
4 configuration; and
5 employing said network address information in conjunction with a network
6 message servicer for cluster communications in said cluster configuration beyond a
7 single local area network.

Cont
1 23. (Original) The method of claim 22 further comprising the steps of:
2 creating routing information for each computer connected to a plurality of routers
3 in said cluster configuration, said routing information identifying which router of
4 said plurality of routers to employ in communicating between said each computer
5 connected to said plurality of routers in said cluster configuration; and
6 storing said routing information on each said computer connected to said plurality
7 of routers in said cluster configuration.

1 24. (Original) The method of claim 22 wherein the step of creating network address
2 information for said each computer in said cluster configuration comprises the step of
3 creating a cluster destination address table on said each computer in said cluster
4 configuration, wherein the step of creating said cluster destination address table comprises
5 creating a cluster destination address table entry for said each computer in said cluster
6 configuration, said cluster destination address table entry including at least one network

7 address for a computer in said cluster configuration corresponding to said cluster
8 destination address table entry.

1 25. (Original) The method of claim 24 wherein the step of employing said network
2 address information in conjunction with a network message servicer for cluster
3 communications in said cluster configuration beyond a single local area network comprises
4 the steps of:

5 retrieving said at least one network address from at least one cluster destination
6 address table entry corresponding to at least one computer in said cluster
7 configuration;

8 employing said network message servicer to send at least one cluster message to
9 said at least one computer in said cluster configuration by passing said retrieved at
10 least one network address for said at least one computer in said cluster
11 configuration along with said at least one cluster message to a network message
12 servicer, said network message servicer routing said at least one cluster message to
13 said at least one computer in said cluster configuration using said retrieved at least
14 one network address.

1 26. (Original) The method of claim 25 wherein the step of employing said network
2 message servicer to send at least one cluster message to said at least one computer in said
3 cluster configuration comprises the step of passing said retrieved at least one network
4 address for said at least one computer in said cluster configuration along with said at least
5 one cluster message to a User Datagram Protocol, said User Datagram Protocol
6 formatting said retrieved at least one network address for said at least one computer in
7 said cluster configuration and said at least one cluster message into at least one packet,
8 said User Datagram Protocol passing said at least one packet to an Internet Protocol, said

9 Internet Protocol routing said at least one packet to said at least one computer in said
10 cluster configuration.

1 27. (Original) The method of claim 24 wherein the step of creating a cluster
2 destination address table for said each computer in said cluster configuration comprises
3 the step of creating a cluster destination address table entry for said each computer in said
4 cluster configuration, said cluster destination address table entry including a primary
5 network address and at least one alternate network address for said computer in said
6 cluster configuration corresponding to said cluster destination address table entry.

1 28. (Previously Amended) The method of claim 27 wherein the step of employing said
2 network address information in conjunction with a network message servicer for cluster
3 communications in said cluster configuration beyond a single local area network comprises
4 the steps of:

5 retrieving at least one network address from at least one cluster destination address
6 table entry corresponding to at least one computer in said cluster configuration;

7 employing said network message servicer to send at least one cluster message to
8 said at least one computer in said cluster configuration by passing said primary
9 network address for said at least one computer in said cluster configuration along
10 with said at least one cluster message to a network message servicer, said network
11 message servicer routing said at least one cluster message to said at least one
12 computer in said cluster configuration using said primary network address;

13 awaiting a reply to said at least one cluster message sent to said at least one
14 computer in said cluster configuration using said primary network address; and

15 employing said network message servicer to send at least one cluster message to
16 said at least one computer in said cluster configuration by passing said at least one
17 alternate network address for said at least one computer in said cluster
18 configuration along with said at least one cluster message to a network message
19 servicer, said network message servicer routing said at least one cluster message to
20 said at least one computer in said cluster configuration using said at least one
21 alternate network address, when said reply to said at least one cluster message sent
22 to said at least one computer in said cluster configuration using said primary
23 network address is not received in a timely manner.

Cont'd
1 29. (Original) The method of claim 22 wherein the step of storing said network
2 address information on said each computer in said cluster configuration comprises the step
3 of storing a copy of said network address information on a first computer in said cluster
4 configuration, said first computer updating said network address information with adapter
5 information about said first computer; said first computer sending a copy of updated
6 network address information to each other computer in said cluster configuration; said
7 each other computer in said cluster configuration updating said network address
8 information with adapter information about said each other computer in said cluster
9 configuration; said each computer in said cluster configuration exchanging said updated
10 network address information such that said each computer in said cluster configuration
11 receives an identical copy of said updated network address information .

1 30. (Original) The method of claim 29 wherein the steps of:
2 updating said network address information about said first computer comprises the
3 step of updating said network address information with adapter type, maximum
4 transmission unit, subnet mask, and class of service for said first computer; and

5 updating said network address information about said each other computer in said
6 cluster configuration comprises the step of updating said network address
7 information with adapter type, maximum transmission unit, subnet mask, and class
8 of service for each other computer in said cluster configuration.

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1 31. (Original) A method of communicating between computers in a cluster comprising
2 the steps of:

3 creating a cluster destination address table on said each computer in said cluster,
4 said cluster destination address table including a cluster destination address table
5 entry for said each computer in said cluster, said cluster destination address table
6 entry including a primary network address and at least one alternate network
7 address for said computer in said cluster corresponding to said cluster destination
8 address table entry;

9 *Cont*
10 9 storing said cluster destination address table on said each computer in said cluster;
10 and

11 11 employing said cluster destination address table in conjunction with a network
12 message servicer for communicating between computers in said cluster without
13 requiring an intervening dedicated local area network.

1 32. (Original) The method of claim 31 further comprising the steps of:

2 adding routing information to said network message servicer for each computer
3 connected to a plurality of routers in said cluster, said routing information
4 identifying which router of said plurality of routers to employ in communicating
5 between said each computer connected to said plurality of routers in said cluster.

1 33. (Original) The method of claim 31 wherein the step of employing said cluster
2 destination address table in conjunction with a network message servicer for
3 communicating between computers in said cluster without requiring an intervening
4 dedicated local area network comprises the steps of:

5 retrieving at least one primary network address from at least one cluster
6 destination address table entry corresponding to at least one computer in said
7 cluster; and

8 employing said network message servicer to communicate with at least one
9 computer in said cluster by passing said retrieved at least one primary network
10 address for said at least one computer in said cluster along with at least one cluster
11 message to said network message servicer, said network message servicer routing
12 said at least one cluster message to said at least one computer in said using said
13 retrieved at least one primary network address.

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1 34. (Original) The method of claim 33 wherein the step of employing said network
2 message servicer to communicate with at least one computer in said cluster comprises the
3 step of passing said retrieved at least one primary network address for said at least one
4 computer in said cluster along with at least one cluster message to a User Datagram
5 Protocol, said User Datagram Protocol formatting said retrieved at least one primary
6 network address for said at least one computer in said cluster and said at least one cluster
7 message into at least one packet, said User Datagram Protocol passing said at least one
8 packet to an Internet Protocol, said Internet Protocol routing said at least one packet to
9 said at least one computer in said cluster.

1 35. (Original) The method of claim 31 wherein the step of storing said cluster
2 destination address table on said each computer in said cluster comprises the step of
3 storing a copy of said cluster destination address table on a first computer in said cluster,
4 said first computer updating said cluster destination address table with adapter information
5 about said first computer; said first computer sending a copy of an updated cluster
6 destination address table to each other computer in said cluster; said each other computer
7 in said cluster updating said cluster destination address table with adapter information

8 about said each other computer in said cluster; said each computer in said cluster
9 exchanging said updated cluster destination address table such that said each computer in
10 said cluster receives an identical copy of said updated cluster destination address table.

1 36. (Original) The method of claim 35 wherein the steps of:

2 updating said cluster destination address table with adapter information about said
3 first computer comprises the step of updating said cluster destination address table
4 with adapter type, maximum transmission unit, subnet mask, and class of service
5 for each said primary network address and said each at least one alternate network
6 address for said first computer; and

7 updating said cluster destination address table with adapter information about said
8 each other computer in said cluster comprises the step of updating said cluster
9 destination address table with adapter type, maximum transmission unit, subnet
10 mask, and class of service for each said primary network address and said each at
11 least one alternate network address for said each other computer in said cluster.

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1 37. (Original) A program product comprising:
2 (A) a cluster servicer, said cluster servicer facilitating cluster messaging with at
3 least one other computer without requiring an intervening dedicated local area
4 network to said at least one other computer; and
5 (B) signal bearing media bearing said cluster servicer.

1 38. (Original) The program product of claim 37 wherein said signal bearing media
2 comprises transmission media.

1 39. (Original) The program product of claim 37 wherein said signal bearing media
2 comprises recordable media.

1 40. (Original) The program product of claim 37 further comprising a network
2 message servicer, said network message servicer routing at least one cluster message from
3 said cluster servicer to said at least one other computer.

1 41. (Original) The program product of claim 40 wherein said network message
2 servicer comprises:

3 a User Datagram Protocol, said User Datagram Protocol formatting said at least
4 one cluster message to be sent to said at least one other computer;

5 an Internet Protocol, said Internet Protocol routing said at least one formatted
6 cluster message to said at least one other computer without requiring an
7 intervening dedicated local area network to said at least one other computer.

1 42. (Original) The program product of claim 40 wherein said cluster servicer includes
2 a cluster destination address table, said cluster destination address table comprising at least
3 one network address for said at least one other computer, and wherein said cluster
4 servicer retrieves said at least one network address for said at least one other computer
5 from said cluster destination address table to facilitate cluster messaging with said at least
6 one other computer without requiring an intervening dedicated local area network to said
7 at least one other computer.

1 43. (Original) The program product of claim 42 wherein said cluster destination
2 address table further comprises cluster status information for said at least one other
3 computer.

1 44. (Original) The program product of claim 42 wherein said cluster destination
2 address table further comprises adapter information for said at least one other computer.

1 45. (Previously Amended) A program product comprising:

2 (A) a network message servicer;

3 (B) a cluster servicer, said cluster servicer including a cluster destination address
4 table, said cluster destination address table including at least one address for each
5 of a plurality of apparatuses in a computer cluster, wherein a message to one of
6 said plurality of apparatuses can be sent by said cluster servicer retrieving one of
7 said at least one address for said one of said plurality of apparatuses from said
8 cluster destination address table and passing said retrieved address and said
9 message to said network servicer, wherein said network servicer routes said
10 message to said one of said plurality of apparatuses without requiring an
11 intervening dedicated local area network to said one of said plurality of
12 apparatuses; and

13 (C) signal bearing media bearing said network message servicer and said cluster
14 servicer.

1 46. (Original) The program product of claim 45 wherein said signal bearing media
2 comprises transmission media.

1 47. (Original) The program product of claim 45 wherein said signal bearing media
2 comprises recordable media.

1 48. (Original) The program product of claim 45 wherein said cluster destination
2 address table further comprises adapter information for said each of said plurality of
3 apparatuses.

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1 49. (Original) The program product of claim 45 wherein said cluster destination
2 address table further comprises status information for said each of said plurality of
3 apparatuses.

1 50. (Original) The program product of claim 45 comprising:
2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between said plurality of apparatuses in said computer cluster;
4 an Internet Protocol, said Internet Protocol routing said at least one packet
5 between said plurality of apparatuses in said computer cluster; and
6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including at least one Internet address for
8 each of said plurality of apparatuses in said computer cluster, wherein a message
9 can be sent to one of said plurality of apparatuses in said computer cluster by said
10 cluster servicer determining one of said at least one Internet address for said one of
11 said plurality of apparatuses in said computer cluster from said cluster destination
12 address table and passing said determined Internet address and said message to
13 said User Datagram Protocol, wherein said User Datagram Protocol formats said
14 determined Internet address and said message into at least one packet and passes
15 said at least one packet to said Internet Protocol, wherein said Internet Protocol
16 routes said at least one packet to said one of said plurality of apparatuses in said
17 computer cluster.

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1 51. (Original) The program product of claim 45 wherein said cluster destination
2 address table includes at least one Internet address for said each of said plurality of
3 apparatuses in said computer cluster, and wherein a message to one of said plurality of
4 apparatuses can be sent by said cluster servicer retrieving one of said at least one Internet
5 address for said one of said plurality of apparatuses from said cluster destination address
6 table and passing said retrieved Internet address and said message to said network
7 servicer.

1 52. (Original) The program product of claim 51 wherein said network message
2 servicer comprises:

3 a User Datagram Protocol which formats at least one packet from said message
4 and said retrieved Internet address; and

5 an Internet Protocol, said Internet protocol routing said at least one packet to said
6 one of said plurality of apparatuses networked to said apparatus.

1 53. (Original) The program product of claim 52 wherein said at least two of said
2 plurality of apparatuses in said computer cluster are networked through a plurality of
3 routers, and wherein said Internet Protocol comprises specific routing directions indicating
4 which router of said plurality of routers should be used for routing said at least one packet
5 between said two of said plurality of apparatuses in said computer cluster networked
6 together through a plurality of routers.

1 54. (Previously Amended) A program product comprising:

2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between computers in a cluster of computers;

4 an Internet Protocol suite, said Internet Protocol routing said at least one packet
5 between computers in said cluster of computers; and

6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including a cluster destination address table
8 entry for each computer in said cluster of computers, said each cluster destination
9 address table entry comprising:

10 an Internet address for each network adapter;

11 status information for said each network adapter; and

12 adapter information for said each network adapter;

13 wherein said cluster servicer sends a cluster message to a destination computer in said
14 cluster of computers by determining an Internet address for said destination computer
15 from said cluster destination address table entry for said destination computer and passing
16 said determined Internet address of said destination computer and said cluster message to
17 said User Datagram Protocol, wherein said User Datagram Protocol formats said
18 determined Internet address and said cluster message into a packet and passes said packet
19 to said Internet Protocol, wherein said Internet Protocol routes said packet to said
20 destination computer without requiring an intervening dedicated local area network to said
21 destination computer.

1 55. (Original) The program product of claim 54 wherein said signal bearing media
2 comprises transmission media.

1 56. (Original) The program product of claim 54 wherein said signal bearing media
2 comprises recordable media.

1 57. (Original) The program product of claim 54 wherein said Internet Protocol
2 includes a routing table, said routing table including at least one routing table entry, said at
3 least one routing table entry including a subnet address and corresponding routing
4 direction for said subnet address, and wherein at least one additional routing table entry
5 exists in said routing table for each computer in said cluster of computers that is attached
6 to a plurality of routers, said at least one additional routing table entry including a subnet
7 address and corresponding routing direction for said subnet address that specifies to which
8 router of said plurality of routers to route said at least one packet.

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1 58. (Original) The program product of claim 54 wherein said cluster servicer can
2 employ said cluster destination address table, said User Datagram Protocol, and said
3 Internet Protocol to route all cluster messages necessary to maintain said cluster of
4 computers.

1 59. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said status information in said cluster destination address table whether a
3 network adapter for one of said each computer in said cluster of computers is reachable or
4 unreachable.

1 60. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 assign cluster responsibilities to said each computer in said cluster of computers.

1 61. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 size cluster messages to each network adapter on said each computer in said cluster of
4 computers.

1 62. (Original) The program product of claim 54 wherein at least one computer in said
2 cluster of computers has a plurality of network adapters, and wherein each cluster
3 destination address table entry corresponding to said at least one computer in said cluster
4 of computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

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1 63. (Original) The program product of claim 62 wherein said cluster servicer can send
2 a cluster message to a destination computer with a plurality of adapters by determining an
3 alternate Internet address for said destination computer with a plurality of adapters from
4 said cluster destination address table corresponding to said destination computer with a
5 plurality of adapters, when a timely response from said destination computer with a
6 plurality of adapters is not received after sending a cluster message addressed to said
7 primary Internet address for said destination computer with a plurality of adapters

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Appendix A (Claims)

1 1. (Previously Amended) An apparatus, said apparatus being a member of a cluster,
2 said apparatus comprising:

3 at least one processor;

4 a memory coupled to at least one processor;

5 a cluster servicer residing in said memory, said cluster servicer facilitating cluster
6 messaging, with at least one other apparatus within said cluster, without requiring
7 an intervening dedicated local area network to said at least one other computer.

1 2. (Original) The apparatus of claim 1 further comprising a network message
2 servicer residing in said memory, said network message servicer routing at least one
3 cluster message from said cluster servicer to said at least one other computer.

1 3. (Original) The apparatus of claim 2 wherein said network message servicer
2 comprises:

3 a User Datagram Protocol, said User Datagram Protocol formatting said at least
4 one cluster message to be sent to said at least one other computer;

5 an Internet Protocol, said Internet Protocol routing said at least one formatted
6 cluster message to said at least one other computer without requiring an
7 intervening dedicated local area network to said at least one other computer.

1 4. (Original) The apparatus of claim 2 wherein said cluster servicer includes a cluster
2 destination address table, said cluster destination address table comprising at least one
3 network address for said at least one other computer, and wherein said cluster servicer

4 retrieves said at least one network address for said at least one other computer from said
5 cluster destination address table to facilitate cluster messaging with said at least one other
6 computer without requiring an intervening dedicated local area network to said at least
7 one other computer.

1 5. (Original) The apparatus of claim 4 wherein said cluster destination address table
2 further comprises cluster status information for said at least one other computer.

1 6. (Original) The apparatus of claim 4 wherein said cluster destination address table
2 further comprises adapter information for said at least one other computer.

1 7. (Previously Amended) An apparatus comprising:

2 at least one processor;

3 a memory coupled to at least one processor;

4 a network message servicer residing in said memory; and

5 a cluster servicer residing in said memory, said cluster servicer including a cluster
6 destination address table, said cluster destination address table including at least
7 one address for at least one other apparatus within said cluster, wherein a message
8 to one of said at least one other apparatus can be sent by said cluster servicer
9 retrieving said at least one address for said at least one other apparatus from said
10 cluster destination address table and passing said retrieved address and said
11 message to said network servicer, wherein said network servicer routes said
12 message to said at least one other apparatus without requiring an intervening
13 dedicated local area network to said at least one other apparatus.

1 8. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 further comprises adapter information for each of said at least one address for at least one
3 other apparatus networked to said apparatus.

1 9. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 further comprises status information for each of said at least one address for at least one
3 other apparatus networked to said apparatus.

1 10. (Original) The apparatus of claim 7 operating as a computer cluster, said
2 computer cluster comprising at least one other apparatus networked to said apparatus,
3 wherein each apparatus in said computer cluster comprises:

4 at least one processor;

5 a memory coupled to at least one processor;

6 a User Datagram Protocol residing in said memory, said User Datagram Protocol
7 formatting at least one packet to be sent between apparatuses in said computer
8 cluster;

9 an Internet Protocol residing in said memory, said Internet Protocol routing said at
10 least one packet between apparatuses in said computer cluster; and

11 a cluster servicer residing in said memory, said cluster servicer including a cluster
12 destination address table, said cluster destination address table including at least
13 one Internet address for said each apparatus in said computer cluster, wherein a
14 message can be sent to one of said each apparatus in said computer cluster by said
15 cluster servicer determining one of said at least one Internet address of said one of
16 said each apparatus in said computer cluster from said cluster destination address
17 table and passing said determined Internet address and said message to said User

18 Datagram Protocol, wherein said User Datagram Protocol formats said determined
19 Internet address and said message into at least one packet and passes said at least
20 one packet to said Internet Protocol, wherein said Internet Protocol routes said at
21 least one packet to said one of said each apparatus in said computer cluster.

1 11. (Original) The apparatus of claim 7 wherein said cluster destination address table
2 includes at least one Internet address for said at least one other apparatus networked to
3 said apparatus, and wherein a message to one of said at least one other apparatus can be
4 sent by said cluster servicer retrieving said at least one Internet address for said at least
5 one other apparatus from said cluster destination address table and passing said retrieved
6 Internet address and said message to said network servicer.

1 12. (Original) The apparatus of claim 11 wherein said network message servicer
2 comprises:

3 a User Datagram Protocol which formats at least one packet from said message
4 and said retrieved Internet address; and

5 an Internet Protocol, said Internet protocol routing said at least one packet to said
6 one of said at least one other apparatus networked to said apparatus.

1 13. (Original) The apparatus of claim 12 wherein said at least one other apparatus
2 networked to said apparatus is networked through a plurality of routers, and wherein said
3 Internet Protocol comprises specific routing directions indicating which router of said
4 plurality of routers should be used for routing said at least one packet to said at least one
5 other apparatus.

1 14. (Previously Amended) A cluster of computers, each computer in said cluster of
2 computers comprising:

3 at least one processor;

4 at least one network adapter;

5 a memory coupled to said at least one processor;

6 a User Datagram Protocol residing in said memory, said User Datagram Protocol
7 formatting at least one packet to be sent between computers in said cluster of
8 computers;

9 an Internet Protocol suite residing in said memory, said Internet Protocol routing
10 said at least one packet between computers in said cluster of computers; and

11 a cluster servicer residing in said memory, said cluster servicer including a cluster
12 destination address table, said cluster destination address table including a cluster
13 destination address table entry for each computer in said cluster of computers, said
14 each cluster destination address table entry comprising:

15 an Internet address for each of said at least one network adapter;

16 status information for each of said at least one network adapter; and

17 adapter information for each of said at least one network adapter;

18 wherein said cluster servicer sends a cluster message to a destination computer in said
19 cluster of computers by determining an Internet address for said destination computer

20 from said cluster destination address table entry for said destination computer and passing
21 said determined Internet address of said destination computer and said cluster message to
22 said User Datagram Protocol, wherein said User Datagram Protocol formats said
23 determined Internet address and said cluster message into a packet and passes said packet
24 to said Internet Protocol, wherein said Internet Protocol routes said packet to said
25 destination computer, said Internet Protocol routing said packet to said destination
26 computer without requiring an intervening dedicated local area network to said destination
27 computer.

1 15. (Original) The cluster of computers of claim 14 wherein said Internet Protocol on
2 said each computer in said cluster of computers includes a routing table, said routing table
3 including at least one routing table entry, said at least one routing table entry including a
4 subnet address and corresponding routing direction for said subnet address, and wherein at
5 least one additional routing table entry exists in said routing table for each computer in
6 said cluster of computers that is attached to a plurality of routers, said at least one
7 additional routing table entry including a subnet address and corresponding routing
8 direction for said subnet address that specifies to which router of said plurality of routers
9 to route said at least one packet.

1 16. (Original) The cluster of computers of claim 14 wherein said cluster servicer in
2 each computer in said cluster of computers can employ said cluster destination address
3 table, said User Datagram Protocol, and said Internet Protocol to route all cluster
4 messages necessary to maintain said cluster of computers.

1 17. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said status information in said cluster destination address table whether a
3 network adapter for one of said each computer in said cluster of computers is reachable or
4 unreachable.

1 18. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 assign cluster responsibilities to said each computer in said cluster of computers.

1 19. (Original) The cluster of computers of claim 14 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 size cluster messages to each network adapter on said each computer in said cluster of
4 computers.

1 20. (Original) The cluster of computers of claim 14 wherein at least one computer in
2 said cluster of computers has a plurality of network adapters, and wherein each cluster
3 destination address table entry corresponding to said at least one computer in said cluster
4 of computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of
9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

1 21. (Original) The cluster of computers of claim 20 wherein said cluster servicer can
2 send a cluster message to a destination computer with a plurality of adapters by
3 determining an alternate Internet address for said destination computer with a plurality of
4 adapters from said cluster destination address table corresponding to said destination
5 computer with a plurality of adapters, when a timely response from said destination
6 computer with a plurality of adapters is not received after sending a cluster message
7 addressed to said primary Internet address for said destination computer with a plurality of
8 adapters.

1 22. (Original) A method comprising the steps of:

2 creating network address information for each computer in a cluster configuration;

3 storing said network address information on said each computer in said cluster
4 configuration; and

5 employing said network address information in conjunction with a network
6 message servicer for cluster communications in said cluster configuration beyond a
7 single local area network.

1 23. (Original) The method of claim 22 further comprising the steps of:

2 creating routing information for each computer connected to a plurality of routers
3 in said cluster configuration, said routing information identifying which router of
4 said plurality of routers to employ in communicating between said each computer
5 connected to said plurality of routers in said cluster configuration; and

6 storing said routing information on each said computer connected to said plurality
7 of routers in said cluster configuration.

1 24. (Original) The method of claim 22 wherein the step of creating network address
2 information for said each computer in said cluster configuration comprises the step of
3 creating a cluster destination address table on said each computer in said cluster
4 configuration, wherein the step of creating said cluster destination address table comprises
5 creating a cluster destination address table entry for said each computer in said cluster
6 configuration, said cluster destination address table entry including at least one network
7 address for a computer in said cluster configuration corresponding to said cluster
8 destination address table entry.

1 25. (Original) The method of claim 24 wherein the step of employing said network
2 address information in conjunction with a network message servicer for cluster
3 communications in said cluster configuration beyond a single local area network comprises
4 the steps of:

5 retrieving said at least one network address from at least one cluster destination
6 address table entry corresponding to at least one computer in said cluster
7 configuration;

8 employing said network message servicer to send at least one cluster message to
9 said at least one computer in said cluster configuration by passing said retrieved at
10 least one network address for said at least one computer in said cluster
11 configuration along with said at least one cluster message to a network message
12 servicer, said network message servicer routing said at least one cluster message to
13 said at least one computer in said cluster configuration using said retrieved at least
14 one network address.

1 26. (Original) The method of claim 25 wherein the step of employing said network
2 message servicer to send at least one cluster message to said at least one computer in said
3 cluster configuration comprises the step of passing said retrieved at least one network
4 address for said at least one computer in said cluster configuration along with said at least
5 one cluster message to a User Datagram Protocol, said User Datagram Protocol
6 formatting said retrieved at least one network address for said at least one computer in
7 said cluster configuration and said at least one cluster message into at least one packet,
8 said User Datagram Protocol passing said at least one packet to an Internet Protocol, said
9 Internet Protocol routing said at least one packet to said at least one computer in said
10 cluster configuration.

1 27. (Original) The method of claim 24 wherein the step of creating a cluster
2 destination address table for said each computer in said cluster configuration comprises
3 the step of creating a cluster destination address table entry for said each computer in said
4 cluster configuration, said cluster destination address table entry including a primary
5 network address and at least one alternate network address for said computer in said
6 cluster configuration corresponding to said cluster destination address table entry.

1 28. (Previously Amended) The method of claim 27 wherein the step of employing said
2 network address information in conjunction with a network message servicer for cluster
3 communications in said cluster configuration beyond a single local area network comprises
4 the steps of:

5 retrieving at least one network address from at least one cluster destination address
6 table entry corresponding to at least one computer in said cluster configuration;

7 employing said network message servicer to send at least one cluster message to
8 said at least one computer in said cluster configuration by passing said primary
9 network address for said at least one computer in said cluster configuration along
10 with said at least one cluster message to a network message servicer, said network
11 message servicer routing said at least one cluster message to said at least one
12 computer in said cluster configuration using said primary network address;

13 awaiting a reply to said at least one cluster message sent to said at least one
14 computer in said cluster configuration using said primary network address; and

15 employing said network message servicer to send at least one cluster message to
16 said at least one computer in said cluster configuration by passing said at least one
17 alternate network address for said at least one computer in said cluster
18 configuration along with said at least one cluster message to a network message
19 servicer, said network message servicer routing said at least one cluster message to

20 said at least one computer in said cluster configuration using said at least one
21 alternate network address, when said reply to said at least one cluster message sent
22 to said at least one computer in said cluster configuration using said primary
23 network address is not received in a timely manner.

1 29. (Original) The method of claim 22 wherein the step of storing said network
2 address information on said each computer in said cluster configuration comprises the step
3 of storing a copy of said network address information on a first computer in said cluster
4 configuration, said first computer updating said network address information with adapter
5 information about said first computer; said first computer sending a copy of updated
6 network address information to each other computer in said cluster configuration; said
7 each other computer in said cluster configuration updating said network address
8 information with adapter information about said each other computer in said cluster
9 configuration; said each computer in said cluster configuration exchanging said updated
10 network address information such that said each computer in said cluster configuration
11 receives an identical copy of said updated network address information .

1 30. (Original) The method of claim 29 wherein the steps of:

2 updating said network address information about said first computer comprises the
3 step of updating said network address information with adapter type, maximum
4 transmission unit, subnet mask, and class of service for said first computer; and

5 updating said network address information about said each other computer in said
6 cluster configuration comprises the step of updating said network address
7 information with adapter type, maximum transmission unit, subnet mask, and class
8 of service for each other computer in said cluster configuration.

1 31. (Original) A method of communicating between computers in a cluster comprising
2 the steps of:

3 creating a cluster destination address table on said each computer in said cluster,
4 said cluster destination address table including a cluster destination address table
5 entry for said each computer in said cluster, said cluster destination address table
6 entry including a primary network address and at least one alternate network
7 address for said computer in said cluster corresponding to said cluster destination
8 address table entry;

9 storing said cluster destination address table on said each computer in said cluster;
10 and

11 employing said cluster destination address table in conjunction with a network
12 message servicer for communicating between computers in said cluster without
13 requiring an intervening dedicated local area network.

1 32. (Original) The method of claim 31 further comprising the steps of:

2 adding routing information to said network message servicer for each computer
3 connected to a plurality of routers in said cluster, said routing information
4 identifying which router of said plurality of routers to employ in communicating
5 between said each computer connected to said plurality of routers in said cluster.

1 33. (Original) The method of claim 31 wherein the step of employing said cluster
2 destination address table in conjunction with a network message servicer for
3 communicating between computers in said cluster without requiring an intervening
4 dedicated local area network comprises the steps of:

5 retrieving at least one primary network address from at least one cluster
6 destination address table entry corresponding to at least one computer in said
7 cluster; and

8 employing said network message servicer to communicate with at least one
9 computer in said cluster by passing said retrieved at least one primary network
10 address for said at least one computer in said cluster along with at least one cluster
11 message to said network message servicer, said network message servicer routing
12 said at least one cluster message to said at least one computer in said using said
13 retrieved at least one primary network address.

1 34. (Original) The method of claim 33 wherein the step of employing said network
2 message servicer to communicate with at least one computer in said cluster comprises the
3 step of passing said retrieved at least one primary network address for said at least one
4 computer in said cluster along with at least one cluster message to a User Datagram
5 Protocol, said User Datagram Protocol formatting said retrieved at least one primary
6 network address for said at least one computer in said cluster and said at least one cluster
7 message into at least one packet, said User Datagram Protocol passing said at least one
8 packet to an Internet Protocol, said Internet Protocol routing said at least one packet to
9 said at least one computer in said cluster.

1 35. (Original) The method of claim 31 wherein the step of storing said cluster
2 destination address table on said each computer in said cluster comprises the step of
3 storing a copy of said cluster destination address table on a first computer in said cluster,
4 said first computer updating said cluster destination address table with adapter information
5 about said first computer; said first computer sending a copy of an updated cluster
6 destination address table to each other computer in said cluster; said each other computer
7 in said cluster updating said cluster destination address table with adapter information
8 about said each other computer in said cluster; said each computer in said cluster
9 exchanging said updated cluster destination address table such that said each computer in
10 said cluster receives an identical copy of said updated cluster destination address table.

1 36. (Original) The method of claim 35 wherein the steps of:

2 updating said cluster destination address table with adapter information about said
3 first computer comprises the step of updating said cluster destination address table
4 with adapter type, maximum transmission unit, subnet mask, and class of service
5 for each said primary network address and said each at least one alternate network
6 address for said first computer; and

7 updating said cluster destination address table with adapter information about said
8 each other computer in said cluster comprises the step of updating said cluster
9 destination address table with adapter type, maximum transmission unit, subnet
10 mask, and class of service for each said primary network address and said each at
11 least one alternate network address for said each other computer in said cluster.

1 37. (Original) A program product comprising:

2 (A) a cluster servicer, said cluster servicer facilitating cluster messaging with at
3 least one other computer without requiring an intervening dedicated local area
4 network to said at least one other computer; and

5 (B) signal bearing media bearing said cluster servicer.

1 38. (Original) The program product of claim 37 wherein said signal bearing media
2 comprises transmission media.

1 39. (Original) The program product of claim 37 wherein said signal bearing media
2 comprises recordable media.

1 40. (Original) The program product of claim 37 further comprising a network
2 message servicer, said network message servicer routing at least one cluster message from
3 said cluster servicer to said at least one other computer.

1 41. (Original) The program product of claim 40 wherein said network message
2 servicer comprises:

3 a User Datagram Protocol, said User Datagram Protocol formatting said at least
4 one cluster message to be sent to said at least one other computer;

5 an Internet Protocol, said Internet Protocol routing said at least one formatted
6 cluster message to said at least one other computer without requiring an
7 intervening dedicated local area network to said at least one other computer.

1 42. (Original) The program product of claim 40 wherein said cluster servicer includes
2 a cluster destination address table, said cluster destination address table comprising at least
3 one network address for said at least one other computer, and wherein said cluster
4 servicer retrieves said at least one network address for said at least one other computer
5 from said cluster destination address table to facilitate cluster messaging with said at least
6 one other computer without requiring an intervening dedicated local area network to said
7 at least one other computer.

1 43. (Original) The program product of claim 42 wherein said cluster destination
2 address table further comprises cluster status information for said at least one other
3 computer.

1 44. (Original) The program product of claim 42 wherein said cluster destination
2 address table further comprises adapter information for said at least one other computer.

1 45. (Previously Amended) A program product comprising:

2 (A) a network message servicer;

3 (B) a cluster servicer, said cluster servicer including a cluster destination address
4 table, said cluster destination address table including at least one address for each
5 of a plurality of apparatuses in a computer cluster, wherein a message to one of
6 said plurality of apparatuses can be sent by said cluster servicer retrieving one of
7 said at least one address for said one of said plurality of apparatuses from said
8 cluster destination address table and passing said retrieved address and said
9 message to said network servicer, wherein said network servicer routes said
10 message to said one of said plurality of apparatuses without requiring an
11 intervening dedicated local area network to said one of said plurality of
12 apparatuses; and

13 (C) signal bearing media bearing said network message servicer and said cluster
14 servicer.

1 46. (Original) The program product of claim 45 wherein said signal bearing media
2 comprises transmission media.

1 47. (Original) The program product of claim 45 wherein said signal bearing media
2 comprises recordable media.

1 48. (Original) The program product of claim 45 wherein said cluster destination
2 address table further comprises adapter information for said each of said plurality of
3 apparatuses.

1 49. (Original) The program product of claim 45 wherein said cluster destination
2 address table further comprises status information for said each of said plurality of
3 apparatuses.

1 50. (Original) The program product of claim comprising:

2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between said plurality of apparatuses in said computer cluster;

4 an Internet Protocol, said Internet Protocol routing said at least one packet
5 between said plurality of apparatuses in said computer cluster; and

6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including at least one Internet address for
8 each of said plurality of apparatuses in said computer cluster, wherein a message
9 can be sent to one of said plurality of apparatuses in said computer cluster by said
10 cluster servicer determining one of said at least one Internet address for said one of
11 said plurality of apparatuses in said computer cluster from said cluster destination
12 address table and passing said determined Internet address and said message to
13 said User Datagram Protocol, wherein said User Datagram Protocol formats said
14 determined Internet address and said message into at least one packet and passes
15 said at least one packet to said Internet Protocol, wherein said Internet Protocol
16 routes said at least one packet to said one of said plurality of apparatuses in said
17 computer cluster.

1 51. (Original) The program product of claim 45 wherein said cluster destination
2 address table includes at least one Internet address for said each of said plurality of
3 apparatuses in said computer cluster, and wherein a message to one of said plurality of
4 apparatuses can be sent by said cluster servicer retrieving one of said at least one Internet
5 address for said one of said plurality of apparatuses from said cluster destination address

6 table and passing said retrieved Internet address and said message to said network
7 servicer.

1 52. (Original) The program product of claim 51 wherein said network message
2 servicer comprises:

3 a User Datagram Protocol which formats at least one packet from said message
4 and said retrieved Internet address; and

5 an Internet Protocol, said Internet protocol routing said at least one packet to said
6 one of said plurality of apparatuses networked to said apparatus.

1 53. (Original) The program product of claim 52 wherein said at least two of said
2 plurality of apparatuses in said computer cluster are networked through a plurality of
3 routers, and wherein said Internet Protocol comprises specific routing directions indicating
4 which router of said plurality of routers should be used for routing said at least one packet
5 between said two of said plurality of apparatuses in said computer cluster networked
6 together through a plurality of routers.

1 54. (Previously Amended) A program product comprising:

2 a User Datagram Protocol, said User Datagram Protocol formatting at least one
3 packet to be sent between computers in a cluster of computers;

4 an Internet Protocol suite, said Internet Protocol routing said at least one packet
5 between computers in said cluster of computers; and

6 a cluster servicer, said cluster servicer including a cluster destination address table,
7 said cluster destination address table including a cluster destination address table

8 entry for each computer in said cluster of computers, said each cluster destination
9 address table entry comprising:

10 an Internet address for each network adapter;

11 status information for said each network adapter; and
12 adapter information for said each network adapter;

13 wherein said cluster servicer sends a cluster message to a destination computer in said
14 cluster of computers by determining an Internet address for said destination computer
15 from said cluster destination address table entry for said destination computer and passing
16 said determined Internet address of said destination computer and said cluster message to
17 said User Datagram Protocol, wherein said User Datagram Protocol formats said
18 determined Internet address and said cluster message into a packet and passes said packet
19 to said Internet Protocol, wherein said Internet Protocol routes said packet to said
20 destination computer without requiring an intervening dedicated local area network to said
21 destination computer.

1 55. (Original) The program product of claim 54 wherein said signal bearing media
2 comprises transmission media.

1 56. (Original) The program product of claim 54 wherein said signal bearing media
2 comprises recordable media.

1 57. (Original) The program product of claim 54 wherein said Internet Protocol
2 includes a routing table, said routing table including at least one routing table entry, said at
3 least one routing table entry including a subnet address and corresponding routing
4 direction for said subnet address, and wherein at least one additional routing table entry
5 exists in said routing table for each computer in said cluster of computers that is attached
6 to a plurality of routers, said at least one additional routing table entry including a subnet

7 address and corresponding routing direction for said subnet address that specifies to which
8 router of said plurality of routers to route said at least one packet.

1 58. (Original) The program product of claim 54 wherein said cluster servicer can
2 employ said cluster destination address table, said User Datagram Protocol, and said
3 Internet Protocol to route all cluster messages necessary to maintain said cluster of
4 computers.

1 59. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said status information in said cluster destination address table whether a
3 network adapter for one of said each computer in said cluster of computers is reachable or
4 unreachable.

1 60. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 assign cluster responsibilities to said each computer in said cluster of computers.

1 61. (Original) The program product of claim 54 wherein said cluster servicer can
2 determine from said adapter information in said cluster destination address table how to
3 size cluster messages to each network adapter on said each computer in said cluster of
4 computers.

1 62. (Original) The program product of claim 54 wherein at least one computer in said
2 cluster of computers has a plurality of network adapters, and wherein each cluster
3 destination address table entry corresponding to said at least one computer in said cluster
4 of computers with a plurality of network adapters includes an Internet address for each of
5 said plurality of network adapters, said plurality of Internet addresses ordered
6 preferentially in said cluster destination address table entry, and wherein said cluster
7 servicer can send a cluster message to a destination computer with a plurality of adapters
8 by determining a primary Internet address for said destination computer with a plurality of

9 adapters from said cluster destination address table entry corresponding to said destination
10 computer with a plurality of network adapters.

1 63. (Original) The program product of claim 62 wherein said cluster servicer can send
2 a cluster message to a destination computer with a plurality of adapters by determining an
3 alternate Internet address for said destination computer with a plurality of adapters from
4 said cluster destination address table corresponding to said destination computer with a
5 plurality of adapters, when a timely response from said destination computer with a
6 plurality of adapters is not received after sending a cluster message addressed to said
7 primary Internet address for said destination computer with a plurality of adapters